

CLAIM AMENDMENTS

This listing of claims will replace all prior versions and listings of claims in the application.

Listing of Claims

1 1. (Currently Amended) A method of emulating Virtual Provide Local Area Network
2 Service (VPLS) in an Asynchronous Transfer Mode (ATM) network, comprising the following
3 steps-of:

4 configuring, at a plurality of provider edge devices (PEs), a VPLS having a VPLS
5 Identifier (ID);

6 exchanging information between the PEs indicating a respective ATM address at each PE
7 which is associated with the VPLS;

8 selecting a first PE and a second PE for a virtual circuit when the first PE determines that
9 the second PE supports the VPLS ID;

10 determining whether the first PE or the second PE should initiate the virtual circuit; and

11 for each pair of PEs, automatically establishing a respective virtual circuit between the
12 pair of PEs using the respective ATM address of each PE as endpoints of the virtual circuit;
13 wherein a first PE of the pair of PEs determines whether the first PE is to initiate the circuit, such
14 that only one PE of the pair of PEs establishes the virtual circuit.

1 2. (Original) The method of claim 1 wherein at each PE, the respective ATM address
2 associated with the VPLS is unique to the VPLS.

1 3. (Original) The method of claim 1 wherein a second VPLS is emulated at a plurality of
2 the PEs, and wherein at each such PE the respective ATM address associated with the VPLS is
3 also associated with the second VPLS.

1 4. (Currently Amended) A method of emulating Virtual Provide Local Area Network
2 Service (VPLS) in an Asynchronous Transfer Mode (ATM) network, comprising the following
3 ~~steps of:~~

4 configuring, at a plurality of provider edge devices (PEs) arranged in a Private Network-
5 Network Interface (PNNI) hierarchy, a VPLS having a VPLS Identifier (ID);

6 at each PE, generating a PNNI Topology State Element (PTSE) including a VPLS
7 Information Group (IG), the VPLS IG indicating the VPLS ID, an ATM address to be associated
8 with the VPLS, and a traffic characteristic associated with the VPLS ID and the ATM address;

9 flooding each VPLS IG throughout the PNNI hierarchy;

10 selecting a first PE and a second PE for a virtual circuit when the first PE determines that
11 the second PE supports the VPLS ID;

12 determining whether the first PE or the second PE should initiate the virtual circuit; and

13 ~~for each pair of PEs, automatically~~ establishing a respective virtual circuit between the
14 pair of PEs using the respective ATM address of each PE as endpoints of the virtual circuit,

15 wherein the virtual circuit comprises a traffic characteristic equal to the minimum traffic
16 characteristic of the pair of PEs .

1 5. (Original) The method of claim 4 wherein the step of flooding each VPLS IG throughout
2 the PNNI hierarchy comprises the steps of:

at each PE, flooding the PTSE throughout a peer group of the PE, each peer group having a peer group leader;

at each peer group leader, receiving each PTSE generated by a PE within the peer group of the peer group leader and flooding such PTSEs throughout a parent logical group of the peer group leader;

at each peer group leader, receiving at least one other PTSE, each other PTSE containing a VPLS IG indicating an association between the VPLS ID and an ATM address, from the parent logical group of the peer group leader; and

at each peer group leader, flooding the at least one other PTSE throughout the peer group of the peer group leader.

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6. (Currently Amended) A method of emulating Virtual Provide Local Area Network Service (VPLS) in an Asynchronous Transfer Mode (ATM) network, comprising the following steps:

configuring, at a plurality of provider edge devices (PEs), a VPLS having a VPLS Identifier (ID);

at each PE, generating a PNNI Augmented Routing (PAR) Service IG including the VPLS ID, an ATM address to be associated with the VPLS, and a traffic characteristic associated with the VPLS ID and the ATM address;

flooding each PAR Service IG throughout the ATM network;

10 selecting a first PE and a second PE for a virtual circuit when the first PE determines that
11 the second PE supports the VPLS ID;
12 determining whether the first PE or the second PE should initiate the virtual circuit; and
13 for each pair of PEs, automatically establishing a respective virtual circuit between the
14 pair of PEs using the respective ATM address of each PE as endpoints of the virtual circuit,
15 wherein the virtual circuit comprises a traffic characteristic equal to the minimum traffic
16 characteristic of the pair of PEs .

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1 7. (Original) The method of claim 6 wherein at least one other PE uses Proxy PAR to
2 exchange with PEs ATM addresses to be associated with the VPLS.

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1 8. (Original) The method of claim 7 wherein the at least one other PE is attached to the
2 ATM network via an ATM link employing an ATM User Network Interface (UNI) signaling
3 protocol.

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1 9. (Original) The method of claim 7 wherein the at least one other PE is attached to the
2 ATM network via an ATM link employing an ATM Inter-Network Interface (AINI) signaling
3 protocol.

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1 10. (Currently Amended) A method of advertising a service having a service identifier (ID)
2 within an Asynchronous Transfer Mode (ATM) network, the ATM network including a plurality

3 of nodes arranged in a Private Network-Network Interface (PNNI) hierarchy, the method
4 comprising the following steps-of:

5 at each node which supports the service, generating a PNNI Topology State Element
6 (PTSE) including a service Information Group (IG), the service IG indicating the service ID and
7 an ATM address to be associated with the service; and

8 flooding each PTSE throughout the PNNI hierarchy by generating at least one message,
9 each message containing at least two PTSEs;

10 selecting a first PE and a second PE for a virtual circuit when the first PE determines that
11 the second PE supports the VPLS ID;

12 determining whether the first PE or the second PE should initiate the virtual circuit; and

13 automatically establishing a respective virtual circuit between the pair of PEs using the
14 respective ATM address of each PE as endpoints of the virtual circuit.

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1 11. (Currently Amended) A method of advertising a service having a service identifier (ID)
2 within an Asynchronous Transfer Mode (ATM) network, the ATM network including a plurality
3 of nodes arranged in a Private Network-Network Interface (PNNI) hierarchy, the method
4 comprising the following steps-of:

5 at each node which supports the service, generating a PNNI Topology State Element
6 (PTSE) including a service Information Group (IG), the service IG indicating the service ID and
7 an ATM address to be associated with the service; and

8 flooding each PTSE throughout the PNNI hierarchy, wherein the step of flooding each
9 PTSE throughout the PNNI hierarchy comprises:

10 at each PE, flooding the PTSE throughout a peer group of the PE, each peer group having
11 a peer group leader;

12 at each peer group leader, receiving each PTSE generated by a PE within the peer group
13 of the peer group leader and flooding such PTSEs throughout a parent logical group of the peer
14 group leader;

15 at each peer group leader, receiving at least one other PTSE, each other PTSE containing
16 a service IG indicating an association between the service ID and an ATM address, from the
17 parent logical group of the peer group leader; and

18 at each peer group leader, flooding the at least one other PTSE throughout the peer group
19 of the peer group leader by generating at least one message, each message containing at least two
20 PTSEs;

21 selecting a first PE and a second PE for a virtual circuit when the first PE determines that
22 the second PE supports the VPLS ID;

23 determining whether the first PE or the second PE should initiate the virtual circuit; and

24 automatically establishing a respective virtual circuit between the pair of PEs using the
25 respective ATM address of each PE as endpoints of the virtual circuit.

1 12. (Currently Amended) A method of emulating a Virtual Private Local Area Network
2 Service (VPLS) at a Provider Edge device (PE) within an Asynchronous Transfer Mode (ATM)
3 network, comprising the following steps:

4 configuring at the PE a VPLS Identifier (ID) associated with the VPLS, including
5 associating an ATM address with the VPLS ID;

6 advertising the association between the VPLS ID and the ATM address to other nodes
7 within the ATM network;

8 determining other ATM addresses within the ATM network which are associated with the
9 VPLS;

10 for each such other ATM address, determining whether the PE is to set up a virtual circuit
11 with the ATM address by comparing the ATM address of the PE with the other ATM address;

12 and

13 ~~for each such other ATM address with which the PE determines that the PE is to set up a~~
14 ~~virtual circuit, setting up a virtual circuit with the other ATM address~~

15 selecting a first PE and a second PE for a virtual circuit when the first PE determines that
16 the second PE supports the VPLS ID;

17 determining whether the first PE or the second PE should initiate the virtual circuit; and

18 automatically establishing a respective virtual circuit between the pair of PEs using the
19 respective ATM address of each PE as endpoints of the virtual circuit.

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2 13. (Currently Amended) A method of emulating a Virtual Private Local Area Network
3 Service (VPLS) at a Provider Edge device (PE) within an Asynchronous Transfer Mode (ATM)
4 network, comprising the following steps:

4 configuring, at the PE, a VPLS Identifier (ID) associated with the VPLS, including
5 associating an ATM address with the VPLS ID;

6 advertising the association between the VPLS ID and the ATM address to other nodes
7 within the ATM network, including advertising at least one traffic characteristic to be associated
8 with the VPLS ID and the ATM address;

9 determining other ATM addresses within the ATM network which are associated with the
10 VPLS;

11 for each such other ATM address, determining whether the PE is to set up a virtual circuit
12 with the ATM address;

13 selecting a first PE and a second PE for a virtual circuit when the first PE determines that
14 the second PE supports the VPLS ID;

15 determining whether the first PE or the second PE should initiate the virtual circuit; and

16 automatically establishing a respective virtual circuit between the pair of PEs using the
17 respective ATM address of each PE as endpoints of the virtual circuit, and

18 ~~for each such other ATM address with which the PE determines that the PE is to set up a~~
19 ~~virtual circuit, setting up a virtual circuit with the other ATM address wherein the virtual circuit~~
20 comprises a traffic characteristic equal to a minimum of the at least one traffic characteristic and
21 a second traffic characteristic associated with the other ATM address.

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2 14. (Original) The method of claim 13 wherein the step of setting up a virtual circuit
3 comprises setting up the virtual circuit in conformance with the at least one traffic characteristic.

1 15. (Currently Amended) A method of emulating a Virtual Private Local Area Network
2 Service (VPLS) at a Provider Edge device (PE) that is part of a Private Network-Network
3 Interface (PNNI) hierarchy within an Asynchronous Transfer Mode (ATM) network, comprising
4 the following steps-of:

5 configuring at the PE a VPLS Identifier (ID) associated with the VPLS, including
6 associating an ATM address with the VPLS ID;

7 advertising the association between the VPLS ID and the ATM address to other nodes
8 within the ATM network;

9 determining other ATM addresses within the ATM network which are associated with the
10 VPLS;

11 for each such other ATM address, determining whether the PE is to set up a virtual circuit
12 with the ATM address;

13 selecting a first PE and a second PE for a virtual circuit when the first PE determines that
14 the second PE supports the VPLS ID;

15 determining whether the first PE or the second PE should initiate the virtual circuit; and

16 automatically establishing a respective virtual circuit between the pair of PEs using the
17 respective ATM address of each PE as endpoints of the virtual circuit-and

18 ~~for each such other ATM address with which the PE determines that the PE is to set up a~~
19 ~~virtual circuit, setting up a virtual circuit with the other ATM address by sending a setup~~
20 ~~message to the other ATM address, the setup message including the VPLS ID,~~

21 wherein the step of advertising the association between the VPLS ID and the ATM
22 address to other nodes within the VPLS comprises the steps of:

23 generating a PNNI Topology State Element (PTSE) including a VPLS information group
24 (IG), the VPLS IG indicating the VPLS ID and the ATM address associated with the VPLS; and
25 flooding the PTSE throughout the peer group of the node.

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1 16. (Currently Amended) A method of emulating a Virtual Private Local Area Network
2 Service (VPLS) at a Provider Edge device (PE) within an Asynchronous Transfer Mode (ATM)
3 network, comprising the following steps of:

4 configuring, at the PE a VPLS Identifier (ID) associated with the VPLS, including
5 associating an ATM address with the VPLS ID;

6 advertising the association between the VPLS ID and the ATM address to other nodes
7 within the ATM network;

8 determining other ATM addresses within the ATM network which are associated with the
9 VPLS;

10 for each such other ATM address, determining whether the PE is to set up a virtual circuit
11 with the ATM address;

12 selecting a first PE and a second PE for a virtual circuit when the first PE determines that
13 the second PE supports the VPLS ID;

14 determining whether the first PE or the second PE should initiate the virtual circuit; and

15 automatically establishing a respective virtual circuit between the pair of PEs using the
16 respective ATM address of each PE as endpoints of the virtual circuit-and

17 ~~for each such other ATM address with which the PE determines that the PE is to set up a~~
18 ~~virtual circuit, setting up a virtual circuit with the other ATM address by sending a setup~~
19 ~~message to the other ATM address, the setup message including the VPLS ID,~~

20 wherein the step of advertising the association between the VPLS ID and the ATM
21 address comprises the steps of:

22 generating a Private Network-Network Interface (PNNI) Augmented Routing (PAR)
23 Service information group (IG) including the VPLS ID and the ATM address; and
24 flooding the PAR Service IG throughout the ATM network.

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1 17. (Currently Amended) A node within an Asynchronous Transfer Mode (ATM) network,
2 comprising: means for receiving a Virtual Private Local Area Network Service (VPLS)
3 identifier (ID); and

4 a VPLS controller comprising a computer-readable medium encoded with instructions,
5 the computer-readable medium comprising:

6 instructions for associating an ATM address with the VPLS ID;
7 instructions for advertising the association between the ATM address and the VPLS ID to
8 other nodes within the ATM network;
9 instructions for determining other ATM addresses within the ATM network which are
10 associated with the VPLS ID;

11 instructions for, for each such other ATM address, determining whether the node is to set
12 up a virtual circuit with the other ATM address, the instructions for guaranteeing that only one
13 virtual circuit is set up between the node and the other ATM address;

14 instructions for selecting a first PE and a second PE for a virtual circuit when the first PE
15 determines that the second PE supports the VPLS ID;

16 instructions for determining whether the first PE or the second PE should initiate the
17 virtual circuit; and

18 instructions for automatically establishing a respective virtual circuit between the pair of
19 PEs using the respective ATM address of each PE as endpoints of the virtual circuit and

20 ~~instructions for, for each such other ATM address that the node determines that the node~~
21 ~~is to set up a virtual circuit, setting up a virtual circuit with the other ATM address.~~

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1 18. (Original) The node of claim 17 wherein the node is part of a Private Network-Network
2 Interface (PNNI) hierarchy, and wherein the instructions for advertising the association between
3 the ATM address and the VPLS ID comprise:

4 instructions for generating a PNNI Topology State Element (PTSE) including a VPLS
5 information group (IG), the VPLS IG indicating the VPLS ID and the ATM address associated
6 with the VPLS; and

7 instructions for flooding the PTSE throughout a peer group of the node.

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1 19. (Original) The node of claim 17 wherein the node is part of a Private Network-Network
2 Interface (PNNI) hierarchy, and wherein the instructions for advertising the association between
3 the ATM address and the VPLS ID comprise:

4 instructions for generating a PNNI Augmented Routing (PAR) Service information group
5 (IG), the PAR service IG including the VPLS ID and the ATM address to be associated with the
6 VPLS; and

7 instructions for flooding the PAR service IG throughout the ATM network.

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1 20. (Original) The node of claim 17 wherein the instructions for advertising the association
2 between the ATM address and the VPLS ID comprise instructions for delivering the association
3 to a second node using Proxy PAR.

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1 21. (Currently Amended) A node within an Asynchronous Transfer Mode (ATM) network,
2 the node being part of a Private Network-Network Interface (PNNI) hierarchy within the ATM
3 network and comprising a computer-readable medium encoded with instructions, the computer-
4 readable medium comprising:

5 instructions for receiving a service identifier (ID) identifying a service;

6 instructions for generating a PNNI Topology State Element (PTSE) including a service
7 information group (IG), the service IG indicating the service ID and an ATM address to be
8 associated with the service; and

9 instructions for flooding the service IG throughout the PNNI hierarchy by generating at
10 least one message, each message containing at least two PTSEs;

11 instructions for selecting a first PE and a second PE for a virtual circuit when the first PE
12 determines that the second PE supports the VPLS ID;

13 instructions for determining whether the first PE or the second PE should initiate the
14 virtual circuit; and

15 instructions for automatically establishing a respective virtual circuit between the pair of
16 PEs using the respective ATM address of each PE as endpoints of the virtual circuit.

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1 22. (Currently Amended) A logical group node within a Private Network-Network Interface
2 (PNNI) hierarchy in an Asynchronous Transfer Mode (ATM) network, the logical group node
3 having a peer group and a child peer group, and comprising a computer-readable medium
4 encoded with instructions, the computer-readable medium comprising:

5 instructions for receiving at least one PNNI Topology State Element (PTSE) from nodes
6 within the child peer group, each PTSE including a Virtual Private Local Area Network Service
7 (VPLS) information group (IG), each VPLS IG indicating an association between a VPLS
8 identifier (ID) and an ATM address;

9 instructions for flooding each of the at least one PTSE throughout the peer group;

10 instructions for receiving at least one other PTSE from other logical group nodes within
11 the peer group, each PTSE including a VPLS IG indicating an association between the VPLS ID
12 and an ATM address; and

13 instructions for flooding each of the at least one other PTSE throughout the child peer
14 group by generating at least one message, each message containing at least two PTSEs;

15 instructions for selecting a first PE and a second PE for a virtual circuit when the first PE
16 determines that the second PE supports the VPLS ID;
17 instructions for determining whether the first PE or the second PE should initiate the
18 virtual circuit; and
19 instructions for automatically establishing a respective virtual circuit between the pair of
20 PEs using the respective ATM address of each PE as endpoints of the virtual circuit.